REMARKS

I. Status Of The Claims.

Claims 1-40 are pending in the Application. Claims 2-3 and 14-38 are withdrawn and Claims 1, 4-13 and 39 are rejected.

II. Claim Amendments.

Claims 1 and 39.

Claims 1 and 39 have been amended to clarify Applicants' invention. Claim 1 requires "spaced electrodes in electrical communication with said fluid for applying a potential difference end-to-end across said porous dielectric material within said channel; . . whereby said potential difference generates an electroosmotically-driven flow component through said channel that modulates a pressure-driven flow component resulting from the P1 – P2 pressure differential for controlling the flow through the channel." Claim 39 has been rewritten for format and amended similarly to Claim 1. Applying a potential difference end-to-end across a porous dielectric material to produce an electroosmotic flow. This is described on page 8, lines 24-28 of the specification. Accordingly, these amendments do not add new matter.

New Claim 41.

New Claim 41 is described on page 4, lines 5-30. Accordingly, no new matter is added by new Claim 41.

III. Applicants' Invention.

Applicants' Invention is for an electroosmotic flow controller that controls fluid flow through a combination of electroosmotic flow (EOF) and pressure driven flow (PDF). In effect, flow control is provided by varying the degree of electroosmotic "assist", either in the positive or negative direction, to the pressure driven flow through the channel. An advantage of Applicants' invention is that rapid and accurate flow control can be affected over a wide range of flow rates, both high and low. Further, the flow controller can be used in microscale devices with few or no moving parts and the devices will be compatible with most solvents.

IV. The Rejection under 35 U.S.C. § 103(a).

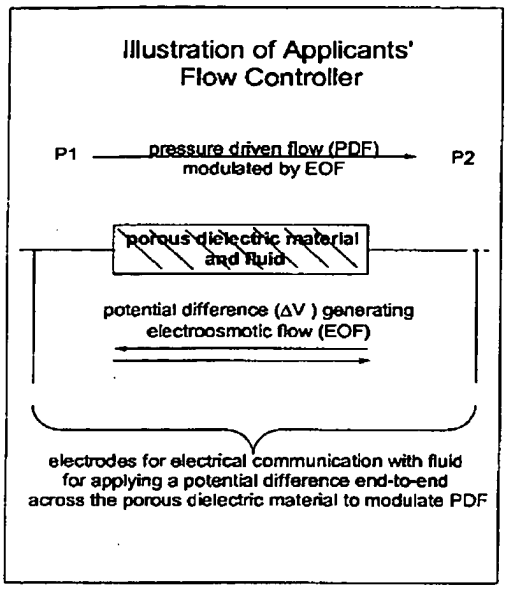
The Office has rejected Claims 1, 4-13, and 39 under 35 U.S.C. § 103(a) as being unpatentable over Rhodes et al. (US 6,004,443) in view of Paul et al. (US 6,019,882) for the reasons stated in numbered paragraph 6 of the Office Action.

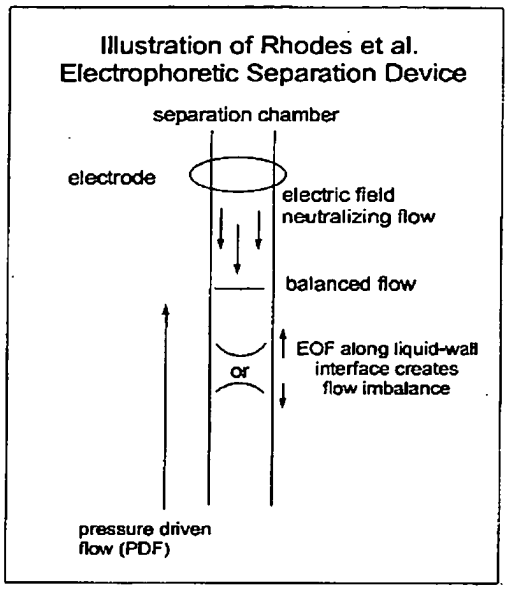
Applicants respectfully traverse the rejection of independent Claims 1 and 39 and request withdrawal of the rejection and allowance of Claims 1 and 39 and Claims 4-13, depending from Claim 1, based on the following remarks.

A. The References Do Not Teach Or Suggest All The Claimed Limitations.

Independent Claims 1 and 39 are limited, in varying language, to spaced electrodes for applying a potential difference end-to-end across said porous dielectric material within a channel, whereby the potential difference generates an electroosmotically-driven flow component through the channel that modulates a pressure-driven flow component. Neither Rhodes et al., nor Paul et al., alone or in combination describe this limitation of Applicants' invention. Accordingly, the Office has not established a *prima facie* case of obviousness.

As shown by the following illustration, in Applicants' claimed flow controller and method for controlling a flow of a fluid, an electroosmotic flow (EOF) component is generated, which modulates, that is, adjusts or controls, a pressure driven flow (PDF) component. The flow controller has spaced electrodes for applying a potential difference end-to-end across a porous dielectric material within the channel. The potential difference generates the electroosmotic flow component within the channel, which modulates the pressure driven flow component. As described in the Specification, the electroosmotic flow can be in either direction depending on the nature of the fluid and the dielectric material. (*See, e.g.*, page 9, lines 21-26).





Rhodes et al., does not describe Applicant's claimed spaced electrodes for applying a potential difference end-to-end across a porous dielectric material within a channel, whereby the potential difference generates an electroosmotically-driven flow component through the channel that modulates a pressure-driven flow component.

As shown in the above illustration and described in the Specification, Rhodes et al. discloses an electrophoretic separation device for chromatographic sample separation in a chamber. The device uses pressure driven flow (PDF) for controllable flow in the column. (Col. 7, lines 43-55). An interaction between the charged solute molecules and the chamber walls creates an excess of positive charge, along the liquid-wall interface. The excess positive charge is attracted toward the cathode in the electrophoretic separation, which causes an EOF of liquid along the liquid-wall interface. Rhodes et al. teaches that an imbalance of these flow rates affects sample separation (*e.g.*, distorts the separation sample into a smile or frown). (Col. 8, lines 1-27). Rhodes et al. teaches ***neutralizing*** flow imbalance, that is, the differences in pressure across the chamber caused by flow imbalance from differing PDF and EOF across the chamber, either through computer control of an applied electric field and/or altering the pump rate (*i.e.*, the PDF rate) to achieve minimum sample dispersion across the

chamber, that is, to achieve the desired flat zone of separating sample. (Col. 17, lines 3-16).

To neutralize the flow imbalance in the chamber, Rhodes et al. describes applying an electrical field to one end of the separation chamber. The electrical communication in the device is shown in Figure 5, and is also described in col. 16, line 61 through col. 17, line 16; and col. 18, line 45 through col. 19, line 7.

As detailed above, Rhodes et al. does not teach or suggest Applicants' claimed limitation of applying a potential difference end-to-end across a porous dielectric material within a channel to generate an EOF, which modulates a pressure driven flow. Paul et. al does not remedy the deficiencies of Rhodes et al. Paul et al. does not teach modulating pressure driven flow in a device with an EOF. Accordingly, neither alone nor in combination do Rhodes et al. and Paul et al. teach or suggest all the claimed limitations of independent Claims 1 and 39 and Claims 4-13, depending from Claim 1. Applicants request withdrawal of the rejection and allowance of all pending claims on this basis.

B. There Is No Suggestion Or Motivation To Combine or Modify The References.

A *prima facie* case of obviousness requires a suggestion or motivation to modify the reference or combine the teachings. MPEP § 2143. If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, there is no suggestion or motivation to make the proposed modification. MPEP § 2143.01. Further, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious. MPEP § 2143.01.

The Office has not established a *prima facie* case of obviousness because (1) the proposed modification renders Rhodes et al. unsatisfactory for its intended purpose; and (2) the proposed modification changes the principle of operation of the device described in Rhodes et al.

Applicants request withdrawal of the rejection and allowance of all claims on this basis.

1. The Proposed Modification Renders Rhodes et al. Unsatisfactory For Its Intended Purpose.

As stated by the Office, Rhodes et al. does not disclose "a porous dielectric material disposed in the flow channel", a limitation of Claims 1 and 39 (Office Action, page 3). The Office cites to Paul et al. to remedy the deficiencies of Rhodes et al., stating "Paul et al. ('882) discloses that it is known in the art to provide a porous dielectric material within a flow channel for the purpose of providing a desired permeability within the flow channel." (Office Action, page 4).

However, combining Rhodes et al. and Paul et al. renders the device described in Rhodes et al. unsatisfactory for its intended purpose. Accordingly, there is no suggestion or motivation to make the proposed modification, and the Office has not established a *prima facie* case of obviousness.

Initially, Applicants would like to point out that the purpose of providing a porous dielectric material disposed within the channel is to create an electroosmotic flow within the channel. Electroosmotic flow within the channel is accomplished by filling or saturating the porous dielectric material with an appropriate liquid and applying a potential difference end-to-end across the material. (*See, e.g.*, Specification, page 8, lines 24-28). The degree of permeability of the porous dielectric material is determined by factors such as pore size, topology number, and physical geometry, and is particular to a given application.

The combination of Rhodes et al. and Paul et al. would render the device described in Rhodes et al. unsatisfactory for its intended purpose. Rhodes et al. describes "chromatography-format fluid electrophoresis", which consists of a buffer pump connected to an electrophoresis separation column. (*See, e.g.*, col. 7-8). As is known to those of skill in the art, and as described in Rhodes et al., col. 8, for example, an electrophoretic separation requires that the sample, solute molecules, and separation medium be disposed within a separation column. If the porous dielectric material described in Paul et al. were substituted into the electrophoresis separation column described in Rhodes et al., the system would not also be able to contain the sample, solute molecules, and separation medium to perform the electrophoretic separation. Simply stated, if the column described in Rhodes et al. is filled with a porous dielectric material and used as a flow controller, the column would not

simultaneously be filled with sample, solute molecules, and separation medium for an electrophoretic separation.

Accordingly, since the proposed modification to Rhodes et al. would render the device unsatisfactory for its intended purpose, *i.e.*, electrophoretic separation, there is no suggestion or motivation to combine or modify the references. Applicants request withdrawal of the rejection and allowance of all claims on this basis.

2. The Proposed Modification Changes The Principle Of Operation Of The Device Described in Rhodes et al.

In its simplest embodiment, the device described in Rhodes et al. consists of a precision buffer pump connected to the inlet of an electrophoresis separation column. The pressure-driven flow (PDF) would normally cause untenable flow dispersion in the separation column. Hoever, positive control of this pressure-flow dispersion is achieved through the use of a flow transducer, which assures plug flow in the separation chamber. (Col. 7, lines 43-55). As stated in Rhodes et al. 'The flow transducer **6** senses very small pressure differences across the chamber and ***neutralizes*** these pressure differences through computer control of the electric field by means of a controlled power supply **18**, thereby controlling electroosmotic and PDFs to achieve minimum sample dispersion within the separation chamber **8**." (Col. 17, lines 8-14, emphasis added).

The flow transducer and electric field described in Rhodes et al. does not control flow, but rather, modulates the character of the flow radially across the separation column (parabolic versus plug-like racial velocity profile within the separation chamber). In contrast to Applicants' invention, which affects the flow rate, the electric field in the Rhodes et al. device is used to achieve flow balance, *i.e.*, affect a desired flat zone of a separating sample, which has been parabolically distorted into a "smile" or "frown" by the interaction between charged solute molecules and the chamber walls. (Col. 8, lines 9-27). Further,

Applicants' invention is directed to a flow controller (Claim 1) and a method of controlling flow (Claim 39). Claims 1 and 39 require a channel where P2 < P1, that is,

Claims 1 and 39 require a at least a finite pressure difference across the channel (the electro-kinetically active element). Modifying the device described in Rhodes et al. to control flow by adding a pressure difference across the inlet (P1) and outlet (P2) of the separation chamber, where P2 < P1, would have no affect on the desired radial flow balance across the separation chamber, and in fact would only intensify the undesired parabolic distortion across the separation chamber.

Accordingly, since the proposed modification to Rhodes et al. changes the principle of operation of the device, there is no suggestion or motivation to combine or modify the references. Applicants request withdrawal of the rejection and allowance of all claims on this basis.

V. New Claim 41.

The Office has not rejected new Claim 41. However, for the sake of completeness, Applicants' submit that new Claim 41 is patentable, and request allowance of this claim, at least for the reasons described above in reference to Claims 1 and 39.

Neither Rhodes et al. nor Paul et al., alone or in combination describe all the limitations of new Claim 41.

Claim 41 is limited to a flow controller wherein "the fluid flow rate within the channel is controlled by the electroosmotically-driven flow component which modulates the pressure-driven flow component." Neither cited reference, alone nor in combination describes controlling a fluid flow rate within a channel by controlling electroosmotic flow, which modulates pressure-driven flow within a channel. The device described in Rhodes et al. is designed to monitor pressure ***across*** the column so electroosmotic flow within the column exactly balances pump-induced flow so that there is no lateral dispersion of the separating sample molecules within the separation medium (*i.e.*, plug flow is achieved). *See, e.g.*, Abstract. In contrast, Applicants claimed invention controls fluid flow rate within the channel by controlling the electroosmotically-driven flow component, which modulates pressure-driven flow component. This is not taught or suggested by either Rhodes et al., or Paul et al.

Claim 41 is further limited to a flow controller having a "sensor" and a "controller

connected to the sensor and the power supply to control the electroosmotically-driven flow component by maintaining the control signal within a predetermined range and modulating the electric potential applied by the power supply". These features are also not described in the cited references.

Accordingly, Applicants request allowance of new Claim 41.

VI. The Nonstatutory Double Patenting Rejections.

Claims 1, 4-13, and 39 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting for the reasons stated in numbered paragraphs 8, 9, and 10, respectively, of the Office Action. Claims 1, and 4-8 have been provisionally rejected over Claim 13 of Co-pending Application No. 10/314,707 (the '707 Application). Claims 8-13 have been and provisionally rejected over Claim 13 of the '707 Application in view of Paul el al. (US 6,019,882), and Claim 39 has been provisionally rejected over Claim 22 of the '707 Application in view of Paul el al. (US 6,019,882).

Applicants respectfully traverse this rejection and request withdrawal of the rejection and allowance of Claims 1, 4-13, and 39, based on the following remarks.

A. The Obviousness-Type Double Patenting Rejection Is Improper.

A requirement for a provisional non-statutory double-patenting rejection is that the conflicting claims in the co-pending applications are (a) by the same inventive entity; or (b) is commonly assigned even though there is no common inventor, or (c) not commonly assigned but have at least one common inventor. *See*, MPEP § 804 CHART III-B; MPEP § 804(II)(B)(1), par. 8.35 Examiner Note 3, par. 8.37 Examiner Note 3.

These requirements are not satisfied and the rejection should be withdrawn.

The inventors of the present Application are Phillip H. Paul, Don W. Arnold, and Christopher G. Bailey and the inventors have assigned the Application to Eksigent Technologies LLC. A copy of the Notice Of Recordation and Assignment is attached for the Examiner's convenience. As shown in the attached Declaration and Power of Attorney for the '707 Application, the inventors are Robert W. Crocker, Kamlesh D. Patel, and Gabriella S. Chirca, all different inventors than that of the present Application. Further, Applicants are

unaware of any assignment of the '707 Application to Eksigent Technologies LLC, and no published document has been found on the United States Patent Office web site that indicates any such assignment has been filed in the '707 Application.

As detailed above, the present Application and the '707 Application (a) have different inventive entities; (b) are not commonly assigned, and (c) do not have a common inventor. Thus, the provisional non-statutory double patenting rejection is improper. Applicants request withdrawal of the rejection and allowance Claims 1, 4-13, and 39 on this basis.

B. The Present Application Is Prior Art Under 35 USC § 102(e)(1) To Co-pending Application No. 10/314,707.

In addition to the impropriety of the non-statutory double patenting rejection, Applicants would like to bring to the Examiner's attention that, as detailed below, the present Application, United States Patent Application Publication No. 2002/0189947 (the '947 Publication) is prior art under 35 USC § 102(e)(1) to the '707 Application.

The '947 Publication, published on December 19, 2002, has an effective filing date of June 13, 2001 (as filed on August 29, 2001, claiming priority to United States Provisional Patent Application No. 60/298,147, filed on June 13, 2001). The effective filing date for the '707 Application is December 9, 2002, as shown in the attached Patent Application Transmittal and Declaration and Power of Attorney forms for the '707 Application (as filed on December 9, 2002 with no claim of priority).

Accordingly, the present Application, the '947 Publication, is prior art under 35 USC § 102(e) to the '707 Application and the '707 Application should not be asserted as prior art against the present Application. Further, if any rejection in the present Application and the '707 Application is to be maintained, according to USPTO practice and procedure, the '947 Publication should be cited as prior art under 35 USC § 102(e) in the '707 Application. *See*, MPEP §§ 706.02(f); 804 (CHART III-B).

CONCLUSION

Applicants believe that the application is in condition for allowance. If there are any issues that can be resolved by telephone with the Applicants' representative, the Examiner is encouraged to contact the undersigned directly.

The Commissioner is hereby authorized to charge payment of $160 ($100 for the excess claim fee and $60 for the 1-month extension fee) any other fee associated with this communication to Deposit Account No. 19-2090.

Respectfully Submitted,
SHELDON & MAK PC

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